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PORTLAND HARBOR RI/FS

ROUND 2 FIELD SAMPLING PLAN SHOREBIRD AREA AND BEACH SEDIMENT SAMPLING

DRAFT

February 24, 2004

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ACRONYMS

Acronym	Definition
CRD	Columbia River Datum
EPA	U.S. Environmental Protection Agency
ERA	ecological risk assessment
FSP	field sampling plan
HHRA	human health risk assessment
HSP	health and safety plan
ISA	initial study area
LWG	Lower Willamette Group
PCBs	polychlorinated biphenyls
PRD	Portland River Datum
PSEP	Puget Sound Estuary Program
QA	quality assurance
QC	quality control
QAPP	quality assurance project plan
RI/FS	remedial investigation/feasibility study
RM	river mile
SVOCs	semi-volatile organic compounds
TOC	total organic carbon

1.0 INTRODUCTION

This Round 2 field sampling plan (FSP) addendum presents the approach and procedures for collection of additional shore sediment samples needed for evaluation of shorebird exposure to support the ecological risk assessment (ERA) and additional beach sediment samples to support the human health risk assessment (HHRA) for the remedial investigation/feasibility study (RI/FS) of the Portland Harbor Superfund Site (Site). Shorebird exposure area samples will be collected at foraging locations within the initial study area (ISA) that were not sampled during Round 1 and at locations downstream of the ISA [river mile (RM) 2-3]. Samples for the HHRA will be collected at potential human use areas downstream of the ISA between RM 2 and 3.

The proposed sampling plan was prepared in response to a proposal submitted by the U.S. Environmental Protection Agency (EPA) to the Lower Willamette Group (LWG) on December 12, 2003 for shorebird exposure area sediment sampling to supplement the Round 1 beach sediment data. The sampling plan also responds to comments from EPA on the March 2003 Programmatic Work Plan requesting shore sampling to evaluate shorebirds and beach sampling at human use areas between RM 2 and 3.

EPA approved the Round 1 QAPP (SEA 2002b) on November 4, 2002. Where appropriate, this FSP references the approved QAPP. A QAPP addendum (which will be revised upon receipt of EPA comments on the April 17, 2003 draft and provided to EPA under separate cover) will contain information on analyses that are pertinent for completion of the Round 2 FSP and were not included in the Round 1 QAPP.

In preparation for the Round 1 sampling program, a health and safety plan (HSP; SEA 2002a) was submitted to EPA on June 14, 2002. This HSP will be amended, as necessary, for Round 2 activities to ensure the health and safety of field and laboratory personnel.

The field study approach, sampling methods, and analyses for shorebird exposure area and human use beach sediment sampling are described in this document. The project organization, field-based data management for the Round 2 sampling program, as well as the field program, methods, and analyses for Round 2 sediment and benthic toxicity testing, are described in the Round 2 FSP (SEA et al. 2003b), submitted to EPA on December 22, 2003.

1.1 OBJECTIVES OF ROUND 2 SHOREBIRD EXPOSURE AREA AND BEACH SEDIMENT SAMPLING

The objectives of the Round 2 shore sediment sampling are to collect surface sediment samples in shorebird foraging habitat to augment the Round 1 beach and nearshore sediment sampling and to collect beach sediment samples from human use beach areas located downstream of the ISA between RM 2 and 3. Along with previous rounds of sampling data, the Round 2 shorebird exposure area sediment data will be used in the

ERA to evaluate risk to shorebirds. Beach sediment data from human use areas will be used in the HHRA in addition to beach sediment data collected in the ISA during Round 1.

1.2 DOCUMENT ORGANIZATION

The remaining sections of this document describe the sampling plan and field procedures that will be used to collect samples from shorebird exposure areas and human use beach areas (between RM 2 and 3 only) during Round 2. Section 2 describes the sampling approaches and proposed schedule. Section 3 includes detailed procedures that will be used in the field, including specific sampling methods for collecting sediment. Section 4 summarizes the laboratory analysis program. Section 5 summarizes how the data will be reported. Finally, references are provided in Section 6.

2.0 SAMPLING DESIGN AND RATIONALE

This section describes the rationale for the sediment sampling design and sampling locations that will support the objectives of the Round 2 sediment sampling. Conditions encountered in the field may result in modifications to the sampling design; however, EPA will be contacted whenever significant changes in the sampling design occur [see Section 3.3 of the Round 2 Field Sampling Plan - Sediment Sampling and Benthic Toxicity Testing (SEA et al. 2003b)].

Sampling locations in the EPA proposal were selected based on the shorebird habitat classification produced by Windward, EPA, and EPA's partners. Twenty-six additional exposure areas were proposed for sampling in Round 2 to evaluate risks to shorebirds from ingestion of sediment and biota during foraging activities.

Potential human health sampling locations were selected based on comments from EPA on the Programmatic RI/FS Work Plan requesting evaluation of human use beach areas between RM 2 and 3.

Potential shorebird exposure area surface sediment and human use area beach sediment sample locations for Round 2 are identified in Figure 2-1. Actual sample numbers and locations will be selected during a reconnaissance visit with the agencies before July 31, 2004. Table 2-1 summarizes Round 2 shorebird exposure area sediment samples and analyses. Table 2-2 summarizes potential Round 2 human use beach area samples and analyses.

Table 2-1. Summary of Round 2 Shorebird Exposure Area Sediment Samples and Analyses

Sample Type	Number of Samples [a]	Metals	SVOCs	PCB Aroclors	Organochlorine Pesticides	Other [b]
Sediment Chemistry	26	X	X	X	X	X

[a] Sample number is approximate and may change based on field reconnaissance results. QC samples not included (see Table 3-2).

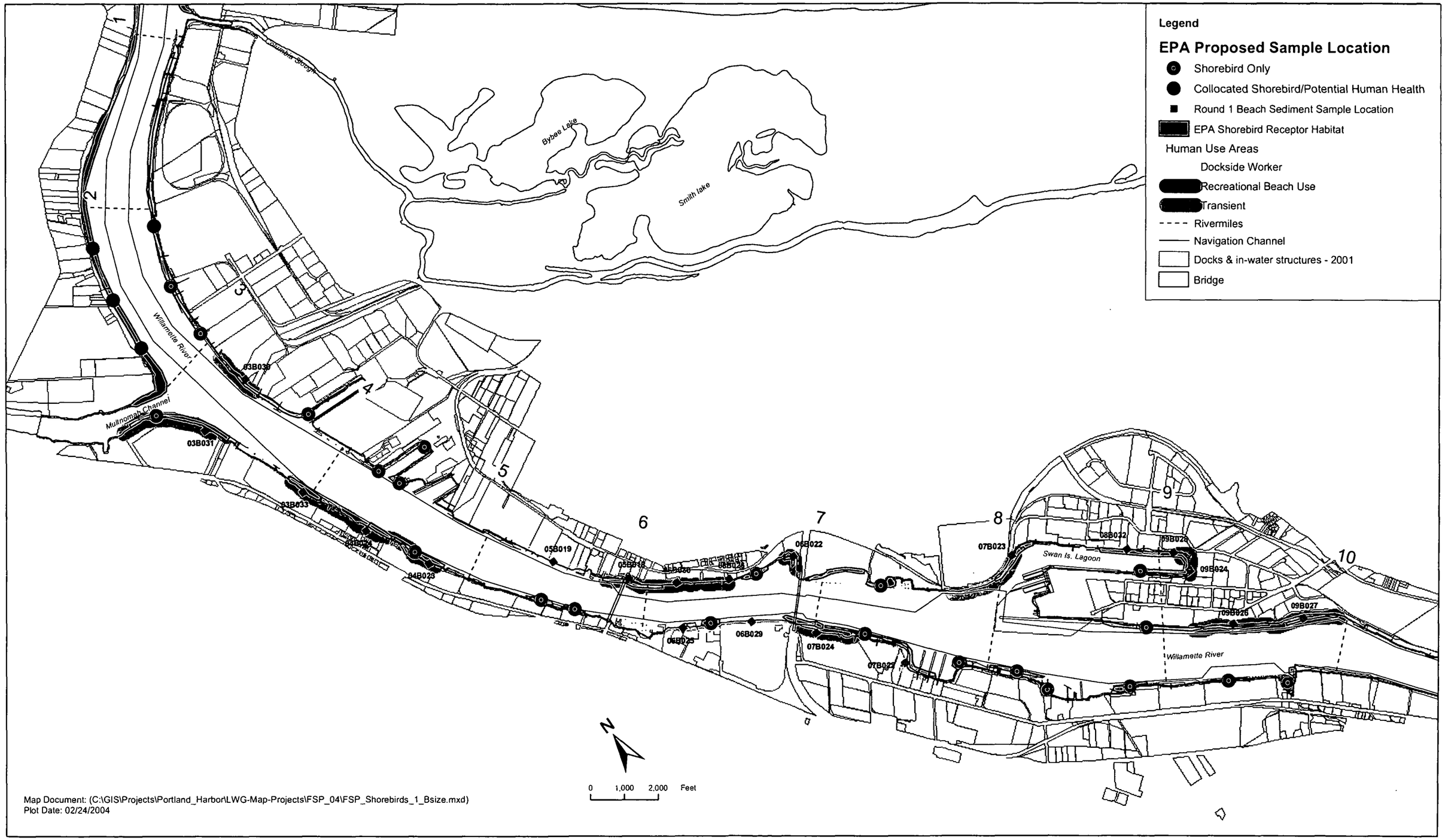
[b] TOC, total solids, and grain size

Table 2-2. Summary of Round 2 Potential Human Use Area Beach Sediment Samples and Analyses

Sample Type	Number of Samples [a]	Metals	SVOCs	PCB Aroclors	Organochlorine Pesticides	Other [b]
Sediment Chemistry	4 (maximum)	X	X	X	X	X

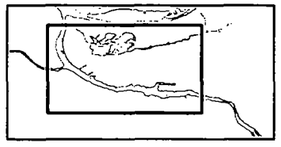
[a] Sample number will be finalized based on field reconnaissance of beaches between RM 2 and 3. QC samples are not included (see Table 3-2).

[b] TOC, total solids, and grain size



Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\FSP_04\FSP_Shorebirds_1_Bsize.mxd)
Plot Date: 02/24/2004

LWG Lower Willamette Group
integral consulting LLC



FEATURE SOURCES:
EPA Proposed Sample Locations: Approximate locations placed by EPA for Shorebird Ecorisk Assessment.
Shorebird Sampling Habitat: DRAFT areas based on Windward Paper Maps and USFWS & EPA Field reconnaissance
Human Use Areas: BES, SEA, KJ, las: update 2/03
Transportation, Water, Property, Zoning or Boundaries: Metro RLIS .
Channel & River miles: Developed from USACOE information.
River Edge, Docks & In-water Structures: created by digitizing on October 2001 0.33 ft. resolution color orthophotos

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Figure 2-1
Portland Harbor RI/FS
Round 2 Field Sampling Plan Addendum
Shore and Beach Sediment Sample Locations

2.1 DATA NEEDS

2.1.1 Ecological Risk Assessment

Shorebirds, represented by the spotted sandpiper (*Actitis macularia*), may be exposed to contaminants because of their unique foraging behaviors (i.e., probing in the sediment) and feeding zones (along the waterline and within intertidal areas). Sediment samples from shorebird foraging areas are needed to assess chemical concentrations in the sediment that may be ingested by the shorebirds. Further reconnaissance work will be conducted during the spotted sandpiper breeding and brooding season (approximately April to July) to verify that proposed sampling locations are accessible for foraging while the sandpipers would typically be present.

2.1.2 Human Health Risk Assessment

During Round 1, beach sediment samples were collected from human use areas within the ISA for assessment of human exposure to sediment. Beach sediment samples will be collected for assessment of human exposures in human use beach areas along the shoreline between RM 2 and 3 where contact with beach sediment could occur. Further reconnaissance work in these areas will be performed in coordination with representatives of EPA and its partners, as appropriate, prior to sample collection to verify potential human use beach areas between RM 2 and 3.

Based on the potential human receptors and the types of activities that could occur, exposure areas will be designated within each of the human use areas during reconnaissance. Exposure areas provide the basis for the beach sediment sampling design and were defined for the Round 1 sampling program for the potential receptors, as follows. For recreational beach users, an exposure area is designated as the length of an uninterrupted river beach. For dockside workers, an exposure area is defined as the river beach area accessible to workers within an individual industrial property. For transient residents, an exposure area is designated as the length of uninterrupted river beach within non-secured areas. Based on information gained during the reconnaissance, exposure areas between RM 2 and 3 for any or all of these receptors may be selected for sampling.

2.2 SAMPLE TYPE

2.2.1 Shorebird Exposure Areas

Composite sediment samples will be collected to represent realistic sediment exposure

point concentrations to assess incidental sediment ingestion of spotted sandpipers. Sediment samples will be composited to represent realistic exposure areas for shorebirds in identified foraging areas. Composite surface (0-15 cm) sediment samples will be collected from each exposure area.

2.2.2 Human Use Beach Areas

Exposure scenarios for human receptors are based on ongoing direct contact with sediment in human use areas. Composite samples are most representative of typical exposures to human receptors, because potential contact with sediment is not likely to occur at discrete locations, but rather would occur throughout an exposure area. Composite surface (0-15 cm) sediment samples will be collected from each human use beach area between RM 2 and 3 verified during the reconnaissance trip. Detailed sample collection procedures are provided in Section 3.2.

2.3 SAMPLE ANALYSES

Sediment samples will be analyzed for metals, semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs) as Aroclors, organochlorine pesticides, total solids, total organic carbon (TOC), and grain size.

2.4 PROJECT SCHEDULE

Actual dates for the Round 2 shore and beach sediment sampling covered by this addendum will be determined following EPA approval of the Work Plan, Round 2 FSP, and QAPP addendum. Other conditions that may affect the sampling schedule are weather, river flows and stages, and equipment conditions and availability. Actual sample locations will be verified during a reconnaissance trip on the river to be conducted during the 2004 shorebird breeding season, approximately April to July, with participation by EPA and its partners. Currently, it is anticipated that the sediment sampling activities for shorebirds covered by this addendum will occur prior to July 31, 2004, whereas human use beach areas will be sampled later in the summer.

Reporting of shore and beach sediment sampling results is discussed in Section 5.

3.0 SAMPLE COLLECTION AND PROCESSING PROCEDURES

The following sections describe the detailed procedures and methods that will be used during Round 2 sediment sampling in shorebird exposure areas and human use beach areas. This includes sampling procedures, record keeping, sample handling, storage, and field quality control procedures.

3.1 SITE RECONNAISSANCE

As noted above, field reconnaissance will be conducted to verify areas available to shorebirds for foraging during the sandpiper breeding and brooding period (April to July). Beaches between RM 2 and 3 will also be evaluated during the field reconnaissance to determine which, if any, of the identified human uses (recreational, transient, and dockside worker) may occur there. Representatives from the LWG and EPA and its partners will be present during the field reconnaissance. The goals of this reconnaissance effort are several:

- Verify that exposure areas identified for sampling are accessible to shorebirds during their typical breeding and brooding period in Portland Harbor.
- Identify beaches between RM 2 and 3 that are potential human use areas and classify according to recreational, industrial, and/or transient uses.
- Evaluate sampling locations to make any potential adjustments in sampling strategy based on the length of the exposure area and the presence of structures or obstacles.
- Review methods for sediment collection for each exposure area.

Following the reconnaissance survey, revised sample locations will be provided to EPA, if needed.

3.2 SAMPLE IDENTIFICATION

Following the field reconnaissance and finalization of the sampling locations, the stations will be renumbered in accordance with the project sample identification code convention described in the Round 2 FSP (SEA et al. 2003b).

3.3 SEDIMENT SAMPLE COLLECTION PROCEDURES

Composite sediment samples will be collected from approximately 26 shorebird foraging areas identified by EPA to provide chemical data in shorebird habitat areas and a maximum of four human use beach areas between RM 2 and 3 (Figure 2-1). The actual number of areas will depend on the results of the reconnaissance survey. At areas identified during the reconnaissance as both shorebird exposure and human use areas, one sample will be collected according to the human use area method and the results will be used in both risk assessments.

3.3.1 Composite Sample Design at Sampling Stations

Shorebird Exposure Areas

Shorebird exposure areas of up to 500 meters in length selected for sampling will be divided into 100-meter segments. If a continuous shoreline includes an exposure area greater than 500 meters in length, the area will be divided into individual sampling stations of equal length that are 500 meters or less, and each station will be divided into two to four segments depending on station length. Exposure areas with discontinuous shoreline due to piers, riprap, or other structures will be sampled as one continuous area unless the obstruction is longer than 100 meters, in which case one of the two segments will be sampled. Within each segment of a sampling station, a transect will be placed parallel to the waterline near the average of the mean waterline [+ 7 feet Columbia River Datum (CRD)] as determined from 1988 to 2002 for the months of April, May, June, and July. These months correspond with the sandpiper breeding season in the Portland Harbor area. Three discrete samples will be collected along each transect, and all the samples within a given sampling station will be composited into one sample for analysis. During the exposure area reconnaissance trip, the sampling strategy and methods for each of the sediment locations will be discussed with EPA and its partners.

Sampling of shorebird areas will be performed by late July 2004. Owners/operators will be contacted prior to the initiation of sampling to obtain access and, if necessary, facilitate relocation or removal of obstructions. The shoreline elevation will be determined by verifying the real-time Portland River Datum (PRD) river stage at the Morrison Bridge gauge. The PRD river stage is 0.3 foot above CRD at that location so the river stage reading can be converted to CRD. The target sample CRD elevation will be measured from the waterline using a graduated staff and level (the elevation error using this method is approximately ± 0.5 foot).

Human Use Beach Areas

Human use beach areas between RM 2 and 3 of up to 610 meters (2,000 feet) in length will be divided into 76-meter (250-foot) segments, as was done in Round 1. If a continuous shoreline includes an exposure area greater than 610 meters in length, the area will be divided into individual sampling stations of equal length that are 610 meters or less, and each station will be divided into 76-meter segments. Human use beach

areas of less than 230 meters (750 feet) in length will be divided into three segments of equal length. Human use beach areas with discontinuous shoreline due to piers, riprap, or other structures will be sampled as one continuous area if the entire area is generally accessible to a recreational user, a transient, or a dockside worker, as applicable. Within each sampling station, three transects parallel to the water line will be defined: 1) at the high water line (as determined from visual observation), 2) at the water line at the time of sampling, and 3) at a distance halfway between the high water line and the water line. Within each segment of a sampling station, a discrete sample will be collected at a random location. Both the distance from one end of the segment and the transect from which the sample will be collected (high, middle, or water line) will be selected using random numbers. The discrete samples collected from each station will be composited into one sample for laboratory analysis.

Human use beach area samples will be collected during low water in August or September. All samples will be collected at or above the water line. Owners/ operators will be contacted prior to the initiation of sampling to obtain access and, if necessary, facilitate relocation or removal of obstructions.

3.3.2 Discrete Sample Collection Procedure

Samples Collected Above the Water Line

Surface (0-15 cm) sediment will be collected using stainless-steel hand cores (if above water line) according to methods described in Gonar and Kemp (1978), Zeh et al. (1981), and Hart Crowser (1991). Sediment will be removed from the top 15 cm at the target elevation using a hand-held coring device 10 cm in diameter by 15 cm in length, with an attached "T" handle for advancing the tube. A valve on top of the device will be opened to allow air and water to escape as the hand-corer is advanced through the sediment, thereby preventing compression of the sediment surface. The device will be gently pushed into the sediment to the 15-cm mark, using a twisting motion to facilitate penetration. Care will be taken to ensure that the sediment surface does not come into contact with the top of the sampler. The retention plate will then be placed into its slot to prevent the sediment from falling out of the corer, and the valve will be closed. The corer will then be slowly extracted and the retained sediment will be placed into a stainless-steel bowl for processing. Prior to processing, the following acceptability criteria must be met:

- The coring device penetrated to the minimum acceptable penetration depth of 15 cm
- Minimal water is present within the sample core
- No loss of sample occurred.

A location near the sampling station will be used to decontaminate sample collection and handling equipment, homogenize the sediment samples, and distribute sample material to collection jars. Further description of the homogenization process is summarized in the following section.

Samples Collected Below the Water Line

If the sample is collected below the waterline (up to 3 feet below waterline will be deemed acceptable for shorebird exposure), a grab sampler such as a Ponar or Ekman dredge will be used, either from a boat or from the shore.

The general procedure for collecting sediment samples using the grab sampler is described below:

1. Maneuver the sampling vessel to the pre-identified sampling location.
2. Open the grab sampler jaws into the deployment position.
3. Guide the sampler overboard until it is clear of the vessel.
4. Lower the sampler through the water column to the bottom at approximately 0.3 m/s.
5. Record the location of the boat when the sampler reaches bottom.
6. Retrieve the sampler and raise it at approximately 0.3 m/s.
7. Guide the sampler aboard the vessel and place it on the work stand on the deck; using care to avoid jostling that might disturb the integrity of the sample.
8. Examine the sample using the following sediment acceptance criteria:
   - The sample does not contain foreign objects
   - The sampler is not over-filled with sediment so that the sediment surface presses against the top of the sampler
   - No leakage has occurred, as indicated by overlying water on the sediment surface
   - No sample disturbance has occurred, as indicated by limited turbidity in the overlying water
   - No winnowing has occurred, as indicated by a relatively flat undisturbed surface
   - The following minimum penetration depths have been achieved:

- 4-5 cm in medium to coarse sand
- 6-7 cm in fine sand
- 10 cm in silt/clay.

1. If these sample acceptance criteria are not achieved, reject the sample. If a sample that meets the appropriate acceptance criteria cannot be obtained after 4 attempts and within 2 meters of the proposed location, the station may be relocated or deleted.
2. Siphon off any standing water from the surface of the sediment using a hose primed with site water. Be careful during siphoning not to disturb the integrity of the sediment surface.
3. Collect the upper surface sediments to a maximum depth of 15 cm from the sampler using a stainless-steel spoon. Take care not to include any material that has been in contact with any interior sampler surface. Place the sediment in a stainless-steel mixing bowl.
4. Thoroughly rinse the interior of the sampler with site water until all loose sediment has been washed off.
5. Repeat procedure at each discrete sample location within a station.
6. Homogenize the discrete sediment samples collected at the station using a cordless drill with a stainless-steel mixing paddle.

After each sample is accepted, it will be described on the sediment description form (Appendix B in SEA et al. 2003a). The following physical characteristics of each sediment sample will be recorded: sediment texture; sediment color; presence, type, and strength of odors; core penetration depth; degree of leakage or sediment surface disturbance; and any obvious abnormalities such as wood/shell fragments, debris, or large organisms.

Following sample description, the sampling personnel will cover the bowl with aluminum foil and locate the next discrete sample location. This process will be repeated until sediment has been collected from three or more discrete sample locations for the composite sample, depending on the length of the station.

Distribute the homogenized sediment to appropriate sample containers according to the sample requirements identified in Table 3-1, secure the container lids, and ensure that sample labels are completely and correctly filled out and affixed to the containers. Clean the exterior of all sample containers and store in an ice chest at 4°C. Ensure that all logbook and grab sample log sheet entries are complete.

Field replicate samples will be collected at approximately 5% of the stations.

Table 3-1. Sample Containers, Preservation, Holding Times, and Sample Volume

Sediment	Containers [a]		Preservation	Holding Time	Sample Size [b]
	Type	Size			
Grain size	G/P	16 oz	4±2°C	6 months	100 g
Mercury	WMG/HDPE	4 oz	deep frozen (-20°C)	180 days [c]	1 g
Metals and total solids	WMG/HDPE	included above	deep frozen (-20°C)	6 months [d]	10 g
SVOCs	WMG	32 oz	deep frozen (-20°C)	1 year	30 - 60 g
Pesticides	WMG	included above	deep frozen (-20°C)	1 year	30 g
PCBs	WMG	included above	deep frozen (-20°C)	1 year	30 g
TOC	WMG/HDPE	included above	deep frozen (-20°C)	6 months	1 g
Archival	WMG	2 - 8 oz	deep frozen (-20°C)	1 year	not applicable
Water (equipment rinse blanks)	**Containers**				
	Type	Size	Preservation	Holding Time	Sample Size
Metals and mercury	HDPE	500 mL	5 ml of 1:1& HNO_3 & 4±2°C	6 months/60 days [e]	200 mL
SVOCs	AG	500 mL	dark; 4±2°C	7 days/40 days [f]	500 mL
Pesticides	AG	500 mL	dark; 4±2°C	7 days/40 days [f]	500 mL
PCBs as Aroclors	AG	500 mL	dark; 4±2°C	7 days/40 days [f]	500 mL

[a] Size and number of containers may be modified by analytical laboratory.

[b] The laboratory will need 3 times the indicated sample weight for at least 5% of the samples to prepare laboratory QC samples. The planned sample volumes will provide sufficient material for laboratory QC.

[c] As approved by EPA (Humphrey 2002)

[d] Metals (except mercury) may be held at -20°C for 2 years (PSEP 1986).

[e] Based on EPA (2002) and EPA Method 1631 Revision D.

[f] Holding time is 7 days to extraction, and extracts must be analyzed within 40 days from extraction.

3.4 SAMPLE HANDLING AND STORAGE

All sample containers will be filled, leaving 0.5 – 1 in. of headspace to prevent the jars from breaking during frozen storage. Sediment samples will be stored on ice or frozen blue-ice packs prior to unloading onshore. At the end of each day in the field, samples will be stored in refrigerators or on ice at a laboratory space to be determined prior to shipping to the analytical laboratories. The samples will be shipped on ice within 48 hours of collection and frozen at the lab. At approximately 5% of the stations, rinsate blanks will be prepared and submitted to the laboratory for analysis. The estimated

number of field and quality control (QC) samples are presented in Table 3-2. Section 4.9 of the Round 2 Field Sampling Plan - Sediment Sampling and Benthic Toxicity Testing (SEA et al. 2003b) provides detailed quality control procedures.

Table 3-2. Summary of Estimated Numbers of Field QC Samples for Shore Sediment [a]

Parameter	Samples	Blind Field Sample Splits[b]	Blind Field Replicates	Field Rinsate Blanks	Total Number of Field Samples
Chemicals of Interest	30	2	2	2	36
Total solids	30	2	2	0	34
Grain size	30	2	2	0	34
TOC	30	2	2	0	34

[a] Field QC sample numbers based on a frequency of 5%.

[b] At EPA's discretion, the field splits may be analyzed by EPA rather than LWG.

4.0 LABORATORY ANALYSIS

This section summarizes the chemical analyses to be performed for the characterization of Round 2 shorebird exposure and human use beach area sediment samples. Sediment sample analyses are summarized in Table 2-1.

The samples will be analyzed for chemicals of interest including metals, SVOCs, organochlorine pesticides, and PCBs as Aroclors. TOC, total solids, and grain size will be analyzed at all shorebird exposure area and human use beach area stations. Analytical methods and QC measurements and criteria are based on current SW-846 requirements and EPA guidance. Detailed laboratory methods, QA procedures, and QA/QC requirements are described in the Round 1 QAPP (SEA 2002b) and the draft QAPP addendum submitted in April 2003 (SEA 2003).

All samples will be maintained according to the appropriate holding times and temperatures for each analysis, as summarized in Table 3-1. Field QC sample requirements are described in Section 4.9 of the Round 2 FSP (SEA et al. 2003b) and summarized in Table 3-2. A temperature blank will be included in each cooler.

Laboratory QA will be implemented as described in the Round 1 QAPP (SEA 2002b) and April 2003 draft QAPP addendum (SEA 2003) and according to the laboratories' respective QA programs, plans, and standard operating procedures. Additional information on analytical methods and laboratory QA program plans for each laboratory is provided in the QAPP and QAPP addendum.

5.0 REPORTING

A Round 2 shorebird exposure area and human use beach area field sampling report will be prepared and submitted to EPA within 60 days of completing the field sample collection effort described in this FSP addendum. The field sampling report will summarize field sampling activities including sampling locations (maps), requested sample analyses, sample collection methods, and any deviations from the FSP.

LWG-validated data for the shore and beach samples will be delivered to EPA in an electronic format within 60 days of completing all Round 2 sampling and analysis activities (i.e., 60 days after receipt of final laboratory report).

Round 2 shorebird exposure area and human use beach area sediment results will be reported in tabular format in the draft RI report. Shore sediment and other Round 2 information and data evaluations will be included in the draft baseline risk assessments.

The final RI report will be prepared after all sampling and analysis rounds for the project are completed.

6.0 REFERENCES

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Transmittal

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		Date:	February 24, 2004
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